



DINÉ POWER AUTHORITY

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AZ CORP COMMISSION
DOCKET CONTROL

ORIGINAL

October 26, 2010

Ms. Carmel Hood
Docket Control Center
Arizona Corporation Commission
1200 West Washington Street
Phoenix, Arizona 85007

RE: Navajo Transmission Project (NTP), Self-Certification Letter for Decision No. 63197 and Docket No: L-00000U-00-0103, for 2009

Dear Ms. Hood:

Enclosed is a Self-Certification Letter detailing the status of Dine Power Authority's (DPA) Navajo Transmission Project (Decision No. 63197) for 2009. This Self-Certification letter addresses the stipulations that were issued in the Certificate of Environmental Compatibility for the project. Thirteen copies and one original draft have been provided for your review and distribution.

DPA appreciates the opportunity to provide you with this information. Please direct any comments or questions to Mr. Ben Hoisington, Project Administrator, or myself at DPA, office telephone number 928-871-2133.

Sincerely,

DINÉ POWER AUTHORITY

Steven C. Begay
General Manager

Enclosure

Arizona Corporation Commission
DOCKETED

OCT 29 2010

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cc: Ben Hoisington, DPA
Arlene C. Arviso, DPA
file

CONDITION 1

This authorization to construct the new transmission line will expire 10 years from the date the Certificate is approved by the Arizona Corporation Commission, unless construction is completed to the point that the line is capable of operating at its rated capacity by that time; provided, however, that prior to such expiration the Applicant may request that the Arizona Corporation Commission extend the time limitation.

RESPONSE

Diné Power Authority (DPA) expects to construct the Navajo Transmission Line within the timeframe designated in the Certificate. If the proposed project construction schedule is delayed for some reason, then DPA will request an extension of the 10-year time limitation. DPA is currently reviewing the results of the initial system impact study report, which includes Segment 1 of the Navajo Transmission Line. This and the path rating study will be providing as part of a future submittal.

CONDITION 2

The corridor for the new transmission line will not exceed 1,000 feet.

RESPONSE

Final design for this project is not complete; however, the corridor within which the transmission line will be constructed and operated will not exceed 1,000 feet.

CONDITION 3

The new transmission line will be built in accordance with the mitigation measures specified in the final construction, Operation, and Maintenance Plan (COMP) concerning the Project. In the event that the new line is constructed along the alternative route described in the application, the Applicant shall ensure that the COMP specifically addresses the alternative route.

RESPONSE

As requested by the federal lead and cooperating agencies the COMP has been renamed the Plan of Development (POD) and is being updated to include current resource, management, and construction information. The Applicant intends to construct the proposed route authorized in the Certificate of Environmental Compatibility Application; however, a final decision regarding this alignment has not been made. Should the Applicant choose to construct the alternative route identified in the Application, all necessary permits will be acquired and modifications to the POD will be completed prior to construction.

CONDITION 4

The Applicant will comply with all existing air and water pollution control standards and regulation, and will all existing applicable ordinances, master plans, and regulations of the State of Arizona, Coconino, Yavapai, and Mohave counties; and any other governmental entities having jurisdiction.

RESPONSE

Final design work for this project has not been completed and construction has not commenced. The Applicant will comply with all existing air and water pollution control standards and regulations, and with all existing applicable ordinances, master plans, and regulations of the State of Arizona; Coconino, Yavapai, and Mohave counties; and any other governmental entities having jurisdiction during the construction and operation of the transmission line.

CONDITION 5

Construction of the new transmission line on non-reservation land shall not begin until Segment 1, as described in the application, has been constructed and is capable of operating at its rated capacity. However, in the event that all rights-of-way and regulatory approvals have been received for Segment 1 and 3 of the Project, financing has been procured for Segment 1 and 3, and construction of Segment 1 has begun, then construction of the non-reservation portions of the Project may begin prior to the completion of Segment 1, as long as Segment 1 is completed, energized and capable of operating at its rated capacity, prior to Segment 3 begin energized.

RESPONSE

Final design work for this project has not been completed. The Applicant intends to design and construct Segment 1 as the initial development of the proposed transmission line and will comply with the requirements for the sequencing of construction, as stipulated in Condition 5.

CONDITION 6

The Applicant will become a member of the Western States Coordinating Council (WSCC) and will file with the Arizona Corporation Commission a copy of the Applicant's WSCC Reliability Criteria Agreement.

RESPONSE

DPA will apply to the WSCC (now called the Western Electricity Coordinating Council [WECC]) prior to the construction of the Project. DPA provides annual updates to the WECC regarding the NTP status.

CONDITION 7

The Applicant will provide the Arizona Corporation Commission copies of interconnection studies concerning the Project as and when such studies are performed.

RESPONSE

DPA is submitting a third report entitled, Navajo Transmission Project Segment 1 (NTP1)/Path 22 & Path 23 Re-rate, Phase II Study Plan Rev.0, dated January 24, 2007. DPA will continue to keep the Arizona Corporation Commission informed about any other interconnection or related studies.

Navajo Transmission Project Segment 1 (NTP 1)/Path 22 & Path 23 Re-rate

**Phase II Study Plan
Rev. 0**

January 24, 2007



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I. Introduction

Dine Power Authority (DPA) is proposing to build a new 500 kV interconnection from the existing Four Corners 500 kV switchyard to the present Navajo-Moenkopi 500 kV transmission line in addition to other system upgrades. DPA's project is called the Navajo Transmission Project Segment 1 (i.e. NTP 1) and is expected to be in-service by late 2010. Arizona Public Service (APS) has been contracted to perform studies in support an accepted rating for the project. A detailed description of the NTP 1 plan of service is provided in a subsequent section.

Western Area Power Administration (WAPA) achieved an accepted rating in the 1990's for an earlier version of the Navajo Transmission Project (NTP). For this earlier version of NTP, the origination and termination points differed from those proposed for NTP 1 as well as other system improvements. Another difference between the two projects is the proposed Desert Rock Energy Project (DREP) scheduled to be in-service by summer 2010. DREP is a two-unit, 1400 MW coal fired generation station located southwest of the present Four Corners 500 kV switching station. DREP plans to interconnect to the NTP 1 thru a 500 kV fold-in of the project. Because of these differences, DPA has chosen to pursue a new accepted rating for the revised project and enter the WECC Project Rating Review process.

On March 14, 2006 DPA initiated the WECC Project Rating Review (PRR) process to obtain an accepted rating for NTP 1. The letter to WECC indicated a proposed non-simultaneous rating of 1500 MW for a given accepted rating. Following the letter to WECC, APS began a Comprehensive Progress Report (CPR) to support the proposed rating. During APS's studies minor changes to the plan of service proposed in the initiation letter were made and the CPR was completed using this updated plan of service. Study results from the CPR show that the updated plan of service for NTP 1 supports a non-simultaneous and simultaneous rating of 1600 MW. In addition, the CPR proposes to eliminate the current Path 22 nomogram and create two separate WECC paths. The actual description of the paths will be discussed in the following section. On December 21, 2006 the CPR for the Navajo Transmission Project Segment 1 was issued for comment to the WECC membership. Also at the same time, a request was made to form a project review group for PRR Phase II studies.

DPA also began the WECC Regional Planning Project Review (RPPR) process for NTP 1 on March 14, 2006 and subsequently formed a RPPR group. The Navajo Transmission Project Segment 1 RPPR group is expected to meet in late January 2007 and the project sponsors are anticipating that the compliance process will be completed by late February. With the completion of the review period of the CPR and RPPR process, the project sponsors will have completed the requirements for the achieving Phase II status in the Project Rating Review process in late February or early March. After achieving Phase II status, the project sponsors will perform studies to reaffirm the results obtained in previous studies.

II. Proposed Plan of Service

As mentioned before, DPA proposes building a 500 kV interconnection between the Four Corners 500 kV switchyard and the Navajo-Moenkopi 500 kV line. NTP 1's plan of service to support a non-simultaneous and simultaneous rating of 1600 MW consists of five major components as listed below. Figure 1 shows the current plan of service for NTP 1.

1. Desert Rock Energy Project (DREP)-Red Mesa East (RME) 500 kV line.

A new 198 mile, 500 kV transmission line will be constructed between the new DREP 500 kV switchyard to the new Red Mesa East 500 kV switching station. Conductor will be double-bundled 2156 kcm Bluebird and the line will be series compensated at the DREP switchyard. Tentative size of the series capacitor is 45 ohm (38% compensation) with a minimum rating of 2200 A continuous. Finally, the line will have two switched shunt reactors (one at each terminal) rated for 154 Mvar @ 500 kV which together will provide 86% shunt compensation for the line. Metering point for NTP 1 will be the DREP terminal.

2. RME 500 kV Switching Station.

The DREP-RME 500 kV line will terminate at a new 500 kV ring bus (RME) which will include a loop-in of the existing Navajo-Moenkopi 500 kV line. Location of the new switchyard is approximately 14 miles south of the Navajo Generation Station. No facilities at the Navajo switching station will be transferred to the RME site and no changes will be made to the compensation level of the Navajo-Moenkopi series capacitor.

3. Replacement of the Four Corners 525/345 kV transformer.

A new 1200 MVA, 525/345 kV (a minimum emergency rating of 1440 MVA) transformer will be installed either in parallel or as a replacement for the existing 840 MVA transformer at the Four Corners 525/345 kV switching station.

4. Upgrade of the Four Corners-Moenkopi Series Capacitor Bank.

The present series capacitor bank in the Four Corners-Moenkopi 500 kV line at the Moenkopi terminal will have its continuous rating upgraded from 1810 A to 2200 A and will have an emergency rating of 2970 A. However, the compensation level (24%) for this bank will remain unchanged.

5. DREP-Four Corners 500 kV line.

A new 16 mile 500 kV transmission line will be constructed from the new DREP 500 kV switchyard to the existing Four Corners 500 kV switching station. Conductor will be double-bundled 2156 kcm Bluebird. As a result, a new 500 kV terminal will be added at the Four Corners site.

Navajo Transmission Project Segment 1

Navajo (14 miles)

Red Mesa East (RME)

177 miles

2,2156 kcm ACSR

26 miles

X = 0.27% 45 ohms/mi

170 MVAR @ 525 kV

170 MVAR @ 525 kV

500 kV

16 miles

2,2156 kcm ACSR

Unit #1

Unit #2

DREP

Four Corners

525/345 kV 1100 MVA

Future

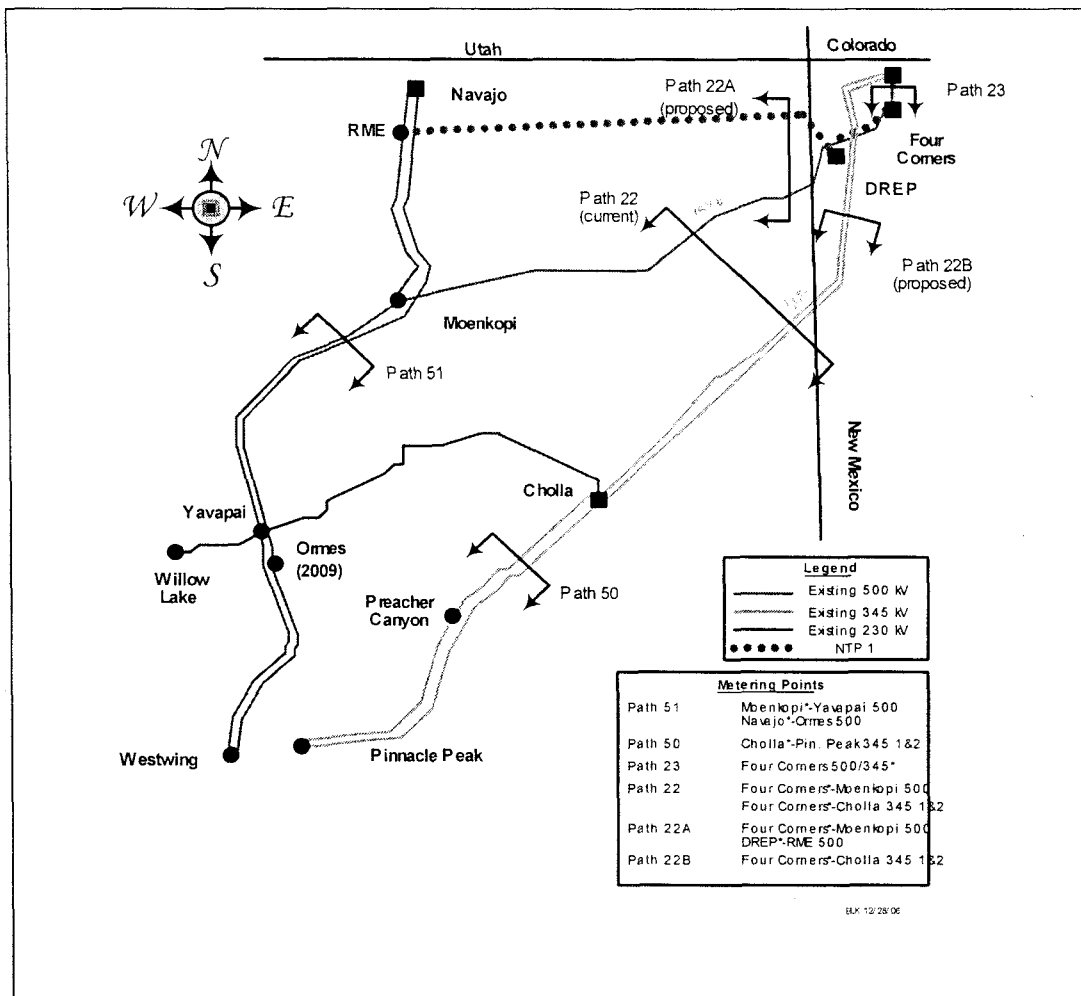
Existing

Proposed

BLK 10/21/06

As was mentioned earlier, the project sponsors propose to separate Path 22's existing paths along with a portion of NTP 1 into two separate WECC paths. A path to the west of Four Corners (Path 22A) would consist of the Four Corners-Moenkopi 500 kV line and the Desert Rock-Red Mesa East 500 kV line metered at Four Corners and Desert Rock, respectively. Extending to the south, the Four Corners-Cholla #1 & #2 345 kV lines would comprise the second WECC path (Path 22B) with Four Corners as the metering point for both lines. Figure 2 shows the current and proposed paths for the eastern Arizona and northwestern New Mexico areas.

Figure 2



III. Study Plan Overview

Non-simultaneous analysis

As was performed in the CPR, an analysis will be done to identify the non-simultaneous rating of Path 22A. Due to its expected change as a result of NTP 1, the non-simultaneous rating of Path 22B will also be assessed.

Simultaneous analysis

Once the non-simultaneous rating for Path 22A has been demonstrated, the simultaneous case will be used to evaluate other adjacent paths.

1. **Path 51.** No simultaneous relationship currently exists between Path 22 and Path 51. However, the proposed rating for NTP 1 is required to be assessed at or near the current accepted rating for Path 51.

Sensitivity analysis

Using comments collected during the review period for the NTP 1 CPR, the project sponsors agree to assess the following future projects using the simultaneous case for Path 22A vs. Path 22B as practically as possible. For non-similarly situated projects, the analyses will be purely for information and no attempt will be made to mitigate for violations.

1. **Southern Navajo (Path 51) Upgrade Project.** APS requests that Path 22A and Path 22B be evaluated with the Path 51 Upgrade Project at its proposed maximum rating (3,100 MW). Since both projects are electrically adjacent to one another and are similarly situated within the WECC Project Rating Review process, APS believes each ~~should~~ project should be assessed to determine whether any simultaneous effects exist for each proposed rating.
2. **Combined EOR9300 & Devers-Palo Verde #2.** Southern California Edison (SCE) requests that the Path 22A rating be assessed at the proposed rating for Path 49 (10,500 MW) with both the EOR9300 and Devers-Palo Verde #2 projects included.

IV. Non-simultaneous Analysis

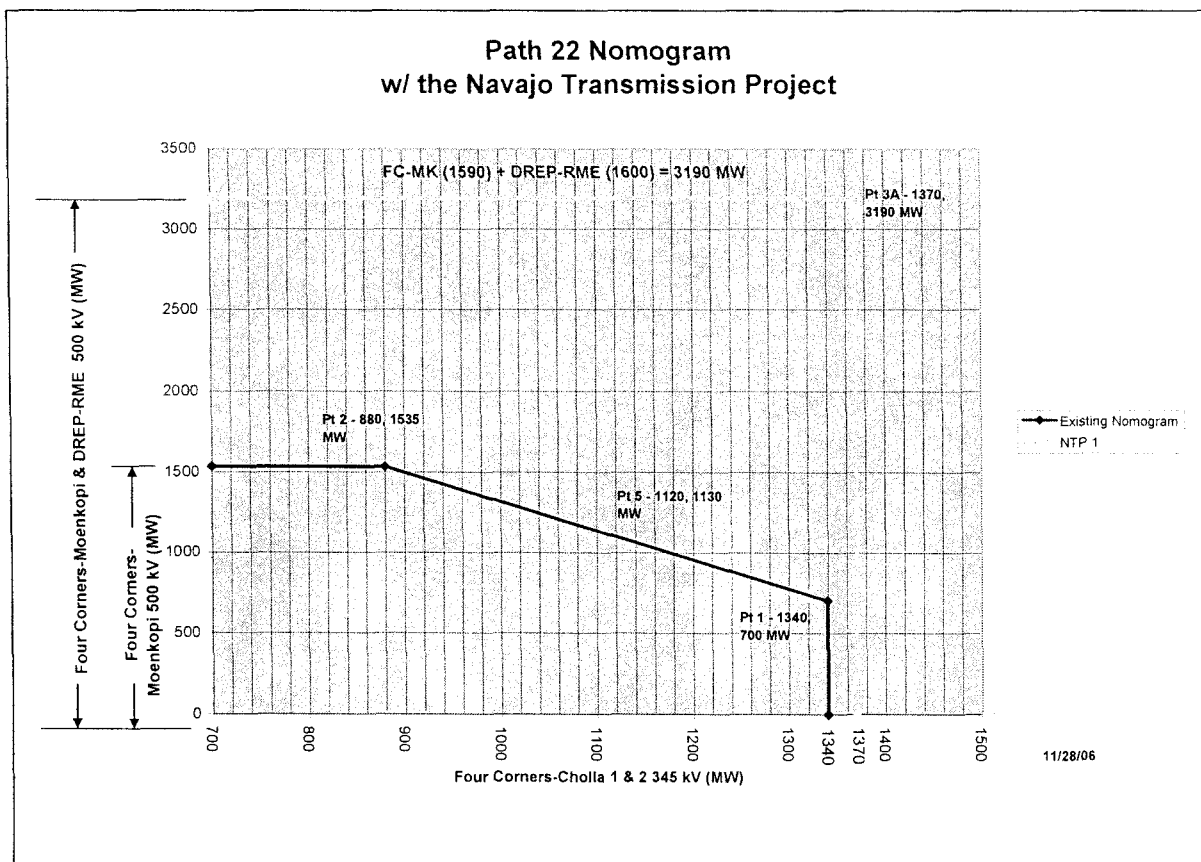
Study assumptions

Study cases

The pre-project cases will be constructed from the WECC approved 11HS1 base case and flows on Path 22 will be adjusted to reflect the present accepted nomogram for the path (WECC 2006 *Path Rating Catalog*). Subsequently, the model representing the current plan of service for NTP 1 will be added to a pre-project case to represent both the proposed non-simultaneous limits of the proposed Path 22A and 22B paths. In other words, Path 22A flows will be at 3190 MW and Path 22B flows will be at 1370 MW as

demonstrated in the NTP 1 Comprehensive Progress Report. Figure 3 shows the current and projected Path 22 nomogram. Both the pre- and post-project cases will be distributed to WATS and the Project Review Group members for approval.

Figure 3



Generation assumptions

The following section includes both existing generators and resource changes that are expected to be in-service in the 2010 timeframe and are to be modeled in this study. Data describing generation upgrades, additions and changes to be used in fourth coming studies comes primarily from WECC's *Existing Generation and Significant Additions and Changes to System Facilities 2005-2015* report. However, other sources are used to justify modifications of resources in the relevant study area and these sources are described below.

1. Table 1 lists the existing generators that will be available for loading paths in the Northwest New Mexico, Northern Arizona and Eastern Arizona areas for 2010. Data for existing units was obtained from WECC's *Existing Generation and Significant Additions and Changes to System Facilities 2005-2015* report.

Table 1

<i>Plant</i>	<i>Ownership(1)</i>	<i>Units</i>	<i>Net Output</i>
Four Corners	W/O	#1-3	560 MW
	J/O	#4 & 5	1480 MW ¹⁵⁰⁰
San Juan	J/O	#1-4	1647 MW
Cholla	W/O	#1-3	615 MW
	W/O	#4	380 MW
Coronado	W/O	#1 & 2	785 MW
Springerville	W/O	#1 & 2	800 MW
	J/O	#3	400 MW
Navajo	J/O	#1-3	2250 MW

(1) W/O – wholly owned. J/O – jointly owned.

- Four Corners unit #4 and #5 have a reporting change in WECC's *Existing Generation and Significant Additions and Changes to System Facilities 2005-2015* report of 10 MW (**20 MW** total) each for a total net output of 1500 MW.
- A System Impact Study for the Desert Rock Energy Project was completed in 2006 which demonstrated that the unit can reliably connected **1400 MW** to the modified network in 2010.
- Springerville unit #4 addition was reported in WECC's *Existing Generation and Significant Additions and Changes to System Facilities 2005-2015* for a net addition of **400 MW** in 2010. As described in the next section, there are transmission reinforcements associated with this generation addition.
- Cholla unit #2 has been reported in the latest WECC Loads and Resources submittal for a net increase of **15 MW** for a total output of 260 MW. Also, Cholla unit #3's net output has increased by **11 MW** to a total net injection of 271 MW. Both changes are effective as of January 2007.

Transmission assumptions

Listed below are projects expected to be included in both the pre- and post-project cases for the proposed study area.

- Scheduled to be completed in 2010, the Southern Navajo Upgrade Project is currently underway. This project includes both compensation and ampacity upgrades of the four series capacitors in Path 51. Due to the upgrades, the Southern Navajo owners have elected to increase the path rating and are currently pursuing an accepted rating from WECC.

- Upgrade the C3 bank (NV*-OR) to 40.5 Ω , 1750/2362 A.

- b. Upgrade the C10 bank (NV-OR*) to 40.5 Ω , 1750/2362 A.
 - c. Upgrade the C9 bank (WW*-YA) to 25.7 Ω , 1750/2362 A.
 - d. Upgrade the C6 bank (MK*-YA) to 25.7 Ω , 2200/2970 A
 - e. Rebuild/re-conductor Yavapai-Willow Lake 230 kV to 800/1000 A.
2. Line reactors on the Southern Navajo system are currently being replaced due to age and the size will be standardized to 154 Mvar @ 500 kV. This project is expected to be complete by 2010.
3. In 2009, the Navajo-Westwing 500 kV will be folded into the new Ormes 500 kV switching station. As a result, the new 154 Mvar reactor at Westwing and the upgraded C10 series capacitor will be relocated to the northern terminal at Ormes.
4. As currently scheduled, the TS9-Pinnacle Peak 500 kV line will be placed in-service in 2010. Included in this project is the fold-in of the Ormes-Westwing 500 kV line into the TS9 substation.
5. Transmission reinforcements for the addition of unit #4 at Springerville are listed below and are expected to be in-service by winter 2009/10.
 - a. Reconductor the Silver King-Goldfield 230 kV line to 1,650/1950 A.
 - b. Add 2nd 500/345 kV, 672/806 MVA transformer at Coronado.
 - c. Add (50%, 52 Ω , 2000/2700 A) series compensation to the Coronado-Silver King 500 kV line.
 - d. Shunt capacitors on the 345 kV bus at Pinnacle Peak (size to be determined later).
6. Both the EOR9300 project and the Devers-Palo Verde #2 project are assumed to be in-service for the 2010 time frame.

Path flow assumptions

The paths listed in Table 2 are the non-simultaneous ratings for the paths in the northwestern New Mexico, northern Arizona and eastern Arizona areas. At this time only one path is currently similarly situated in the WECC Project Rating Review process and will be studied at its proposed rating. Due to anticipated load and generation patterns, the actual flows to be studied in this analysis may be below the rating given in the table. Consequently, these operating limits will be used as the actual limitations in this study.

Table 2

Path	Description	Rating	Direction
Path 51	Southern Navajo	3100 MW(1)	southbound
Path 50	Cholla-Pinnacle Peak	1200 MW	southbound
Path 23	Four Corners 345/500 Qualified Path	840 MW	345 to 500 kV

Path 22	West of Four Corners	1590 MW(2)	westbound
Path 22	South of Four Corners	1340 MW(2)	southbound

(1) Proposed rating for the Southern Navajo Upgrade Project.

(2) Path 22 is currently governed by a nomogram between the 500 kV and 345 kV paths, which are proposed to be split into separate WECC paths (A & B) if NTP 1 is constructed.

Study methodology

All analyses in support of this Phase II study will comply with applicable NERC/WECC Planning Standards as defined in WECC's *Reliability Criteria* manual. Local reliability criteria will be observed where it is historically defined.

Power flow analysis

Within the power flow analysis, normal, single-contingency and credible double-contingency conditions will be studied to verify that the expected plan of service for NTP 1 will support its proposed rating.

Study criteria:

1. Under normal conditions, bus voltages must be maintained between .95 pu and 1.05 pu, unless previously defined minimum voltage or var scheduling requirements exist. All transmission line and transformer loadings will be within normal continuous ratings.
2. Under emergency or contingency conditions, the following limits or constraints will apply.
 - a. No transmission element will be loaded above its emergency rating as defined by the operating entity or the base case used in the analysis. Ratings for most major Southwest facilities are provided in Appendix A.
 - b. Equipment emergency voltage limits will not be exceeded.
 - c. Bus voltage deviations determined thru the analyses shall not exceed planning limits. A representative list for the Southwest is provided in Appendices B and C.
 - d. No load shedding will be allowed for single contingencies unless previously defined.
 - e. A list of single-contingency outages to be taken as part of this study effort is shown below.
 - a) Four Corners-Moenkopi 500 kV
 - b) Four Corners-Cholla #2 345 kV
 - c) Cholla-Pinnacle Peak 345 kV

- d) Cholla-Coronado 500 kV
 - e) Cholla-Saguaro 500 kV
 - f) Coronado-Silver King 500 kV
 - g) Four Corners 500/345 kV transformer
 - h) Four Corners Unit #5
 - i) Navajo Unit #1
 - j) Navajo-Moenkopi 500 kV
 - k) Navajo-RME 500 kV (PP)
 - l) Moenkopi-Yavapai 500 kV
 - m) Yavapai-Westwing 500 kV
 - n) Navajo-Ormes 500 kV
 - o) DREP-RME 500 kV (PP)
 - p) DREP-Four Corners 500 kV (PP)
 - q) RME-Moenkopi 500 kV (PP)
 - r) Navajo-RME 500 kV (PP)
 - s) Mead-Perkins 500 kV
 - t) Navajo-Crystal 500 kV
 - u) Moenkopi-Eldorado 500 kV
 - v) Palo Verde-Devers #1 500 kV
 - w) Palo Verde-Devers #2 500 kV
 - x) Hassayampa-N.Gila 500 kV
- f. A list of credible double-contingency outages to be taken as part of this study effort is shown below.
- a) FC-DREP/FC XFMR breaker failure (PP)
 - b) FC-Moenkopi/FC XFMR breaker failure (PP)
 - c) FC-Moenkopi/FC Unit #5 breaker failure (PP)
 - d) FC-DREP/FC Unit #5 breaker failure (PP)
 - e) Palo Verde-Westwing #1 & #2 500 kV
 - f) RME-Navajo-Moenkopi breaker failure (PP)
 - g) Moenkopi-FC/Moenkopi-Yavapai breaker failure
 - h) Moenkopi-Eldorado/Moenkopi-RME breaker failure (PP)
 - i) Moenkopi-Yavapia/Moenkopi-RME breaker failure (PP)

Transient stability analysis

Transient stability studies will be conducted to assess impacts to adjacent paths at pre- and post-project stress levels for the 2010 time frame. No stability limits currently exist and none were found in the NTP 1 Comprehensive Progress Report study. However, contingencies will be taken to re-verify those results along with an additional disturbance simulations deemed necessary in this effort.

Study criteria:

1. All machines in the system shall remain in synchronism as demonstrated by their relative rotor angles.
2. System stability will also be assessed thru examination of the damping of relative rotor angles and voltage magnitudes.
3. The transient voltage dip should be maintained above 0.80 pu at the Adelanto and Sylmar converter buses.
4. Other transient voltage and frequency dips and duration requirements must meet the criteria of the NERC/WECC Planning Standards (Appendix C).
5. Single-contingency disturbances to be used in the transient stability studies will be the same as those studied in the power flow section.
6. Credible double-contingency disturbances listed in the power flow analysis section will be used in the transient stability studies.
7. Fault damping will be applied using the guidelines in Table 3.

Table 3

Fault Location	Affected Units	Percent Damping
Four Corners 500/345 kV	#5/#4	10%
Coronado 500 kV	#1 & #2	12.5%
Navajo 500 kV	#1-#3	6%

8. Several exploratory double-contingency disturbances listed below will be simulated in the transient stability studies. These disturbances are for informational purposes only.
 - a. Moenkopi-Yavapai/Navajo-Ormes 500 kV
 - b. Yavapai-Westwing/Navajo-Ormes 500 kV
 - c. Navajo-RME/Navajo-Ormes 500 kV
 - d. Moenkopi-RME/Navajo-Ormes 500 kV
 - e. FC-Moenkopi/FC-Cholla #1
 - f. FC-Cholla #1 & #2 345 kV
 - g. Cholla-Pin. Peak #1 & #2 345 kV
 - h. Coronado-Silver King/Cholla-Saguaro 500 kV
 - i. Cholla-Saguaro/Cholla-Pin. Peak #1
 - j. Cholla-Coronado/Cholla-Pin. Peak #1
 - k. FC-Moenkopi/FC-San Juan

9. In accordance with regional practices, 7% generation margin will be added to the net output of all three Navajo generators. The following contingencies will be simulated with the generation margin added.
 - a. Navajo-Crystal 500 kV
 - b. Navajo-Moenkopi 500 kV
 - c. Navajo-Ormes 500 kV
 - d. Moenkopi-Eldorado 500 kV
 - e. Navajo-RME 500 kV (PP)
 - f. Moenkopi-RME 500 kV (PP)
 - g. RME-DREP 500 kV (PP)

Post-transient stability analysis

APS employs a combination of voltage deviation limits (Appendices B & C) and compliance to WECC standards S1-S4 to meet its post-transient performance requirements for WECC Path 22. Currently, there are no limitations as a result of post-transient performance on ratings associated with either the 500 kV or 345 kV paths.

Study assumptions:

1. All loads will be modeled as constant MVA during the first few minutes following an outage or disturbance.
2. All voltages at distribution substations will be restored to normal values by transformer tap changers (LTC) and other voltage control devices.
3. Generator Mvar limits will be modeled as a single value for each generator since the reactive power capability curve can not be modeled within the power flow program.
4. No manual operator intervention is allowed to increase the generator Mvar flow.
5. Remedial Action Schemes or Special Protection Systems such as generator dropping, load shedding or blocking of automatic generator control (AGC) will not be considered for single contingencies.
6. Shunt capacitors (132 Mvar) at Adelanto and Marketplace buses will be used in the post-transient voltage deviations exceed 5% at those buses. Although modeled as shunt capacitors, the reactive devices at these buses are actually SVCs.
7. The reactive margin will be measured at five locations: Coconino 230 kV, Yavapai 230 kV, Cholla 230 kV, Pinnacle Peak 230 kV and Silver King 230 kV.
8. Solution assumptions include:

- a. Area interchange: Disabled for reactive margin analysis, enabled for voltage deviation.
 - b. Governor blocking: Baseload flag will be used per WECC practice.
 - c. DC Converter transformer tap adjustment: Enabled.
 - d. Generator voltage remote control: Enabled for selected units plus Palo Verde #1-#3.
 - e. Phase shifter control: Disabled.
 - f. Switched shunt devices: Enabled for voltage deviation and disabled for reactive margin.
9. Single-contingency disturbances to be used in the post-transient stability studies will be the same as those studied in the power flow section.
10. Credible double-contingency disturbances listed in the power flow analysis section will be used in the post-transient stability studies.

V. Simultaneous Analyses

Because the proposed plan of service is anticipated to eliminate the existing Path 22 nomogram and the two path elements are expected to be broken into separate WECC paths (i.e. Path 22A and 22B) with their own new path ratings (3190 MW and 1370 MW, respectively), the corner point case (Figure 3) will be used to assess simultaneous effects against non-simultaneous ratings of other WECC paths.

Path 51

A case will be built to assess the simultaneous effects of the corner case described earlier against the accepted rating for Path 51 in the southbound direction. OTC studies currently show no simultaneous relationship between either of the existing components of Path 22 at their non-simultaneous ratings or limits and the rating of Path 51. Contingencies used for this assessment will be the same as those listed in the power flow analysis section. Contingencies will be assessed in post-disturbance power flow, transient stability and post-transient analyses.

VI. Sensitivity Analyses

Two requests have been made to study Path 22A, Path 22B, and Path 23 at their proposed ratings along with two projects that have yet to be built and have yet to complete the WECC Project Rating Review process.

Path 51 Upgrade Project

Based on a request from APS, Path 22A, Path 22B and Path 23 will be studied at or near their proposed ratings of 3190 MW, 1370 MW and 1040 MW, respectively, with Path 51

at or near its proposed rating of 3100 MW. Contingencies used in the assessment will be the same as those listed in the power flow section.

EOR9300 and Devers-Palo Verde #2 Projects

Path 22A, Path 22B and Path 23 will be studied at or near their proposed ratings with Path 49 at its proposed new rating of 10,500 MW per a request for SCE. Contingencies used in the assessment will be the same as those listed in the power flow section.

VII. Schedule

- Submit Study Plan for review with Project Review Group.
- Submit non-simultaneous base cases for review.
-

Appendix A
Southwest Transmission Line Ratings

EOR TRANSMISSION LINES

Owner	Line Name	kV	% Comp	Continuous (Amps)	Emergency (Amps)
SCE	Palo Verde-Devers	500 kV	50%	2700	3645
SCE	Harquahala-Devers	500 kV	50%	2700	3645
SDG&E	Hassayampa-North Gila	500 kV	50%	2200	2970
SRP	Perkins-Mead	500 kV	70%	2200	2970
NPC/LADWP	Navajo - Crystal	500 kV	72%	2088	2750
NPC/LADWP	Crystal - McCullough	500 kV	73%	2088	2750
SCE	Moenkopi-Eldorado	500 kV	70%	1900	2750
WAPA	Liberty - Mead	345 kV	70%	837	1000

WOR TRANSMISSION LINES

Owner	Line Name	kV	% Comp	Continuous (Amps)	Emergency (Amps)
SCE	Palo Verde-Devers	500 kV	50%	2700	3645
SCE	Devers- Harquahala	500 kV	50%	2700	3645
SDG&E	North Gila-Imperial Valley	500 kV	50%	2200	2970
LADWP	MarketPlace-Adelanto	500 kV	50%	1800	2430
LADWP	McCullough - Victorville 1	500 kV	35%	1600	2400
LADWP	McCullough - Victorville 2	500 kV	35%	1600	2400
SCE	Mohave - Lugo	500 kV	26%	1600	3040
SCE	Eldorado - Lugo	500 kV	35%	1600	2400
LADWP	Mead-Victorville	287 kV		935	1036
SCE	Devers-Coachella	230 kV		1240	1425
SCE	Mirage-Ramon	230 kV		986	986
SCE	Mirage-J.Hinds	230 kV		895	1030
SCE	Eldorado-Pisgah	230 kV		822	822
SCE	Eldorado-Cima	230 kV		822	822
SDG&E	Imperial Valley-El Centro	230 kV		565	656

NEVADA/SOUTHERN CALIFORNIA LINES

NPC	Harry Allen - Mead	500 kV		2787.7	3886.7
NPC	Harry Allen - Northwest	500 kV		2787.7	3886.7
LADWP	Adelanto - Rinaldi	500 kV		1876	2102
LADWP	Adelanto - RSE	500 kV		2113	2460
SCE	Coachella - Ave 42	230 kV		1240	1425
SCE	Devers - Valley	500 kV		3000	3000
SCE	Eldorado - Mohave	500 kV		3000	3000
SCE	Julian Hinds - Mirage	230 kV		895	1030
SCE	Lugo - Mira Loma 2&3	500 kV		3600	4000
SCE	Lugo - Serrano	500 kV		2880	2880
SCE	Lugo - Victorville	500 kV		3000	3000
SCE	Lugo - Vincent #1 & 2	500 kV		3000	3000
SCE	McCullough - Eldorado	500 kV		3000	3000
	McCullough - Davis	230 kV		1100	1210

SDG&E	Imperial Valley-Miguel	500 kV	50%	2600	3510
SCE	Mira Loma – Serrano	500 kV		3000	3000
SCE	Mirage - Ave 42	230 kV		1240	1426

NEVADA/SOUTHERN CALIFORNIA LINES

SCE	Serrano – Valley	500 kV		3000	3000
LADWP	Victorville - Adelanto 1&2	500 kV		3000	3000
LADWP	Victorville – Rinaldi	500 kV		1940	2425
LADWP	Marketplace – McCullough	500kV		3822	4000

LAS VEGAS VALLEY AREA TIE LINES

NPC	Cyrstal - Harry Allen 1&2	230 kV		1896	2728
SCE	Eldorado – Merchant	230 kV		1504	2294
NPC	McCullough – Faulkner	230 kV		855	1052
NPC	McCullough – Merchant	230 kV		1600	1963
NPC	McCullough – Tolson	230 kV		855	1052
WAPA	Mead N – Basic	230 kV		841	925
NPC	Mead N – Decatur	230 kV		855	1052
CRC	Mead N – Eastside	230 kV		1002	1102
NPC	Mead N – Equestrian	230 kV		1600	1963
CRC	Mead N – Newport	230 kV		1002	1102
NPC	Mead S – Equestrian	230 kV		1600	1963
NPC	Mead S – Faulkner	230kV		855	1052
VEA	Mead S – Pahrump	230kV		638	638
NPC/PACE	Red Butte - Harry Allen	345 kV		1948	2399
WAPA	States – Amargosa	230 kV		841	925

MEAD AREA 230 kV TRANSMISSION LINES

	Dry Lake – McCullough	230 kV		603	603
	McCullough – Davis	230 kV		1101	1211
	Mead – Camino	230 kV		902	902
	Mead – Davis	230 kV		841	925
	Mead – Eldorado	230 kV		2325	2325
	Mead – McCullough	230 kV		900	1370
WAPA	Mead N – Basic	230 kV		841	925
NPC	Mead N – Decatur	230 kV		855	1052
CRC	Mead N – Eastside	230 kV		1002	1102
NPC	Mead N – Equestrian	230 kV		1600	1963
CRC	Mead N – Newport	230 kV		1002	1102
NPC	Mead S – Equestrian	230 kV		1600	1963
NPC	Mead S – Faulkner	230kV		855	1052
VEA	Mead S – Pahrump	230kV		638	638
WAPA	States - Amargosa – Basic	230 kV		841	925

PALO VERDE EAST TRANSMISSION LINES

J/O	Palo Verde – Westwing 1&2	500 kV		3000	3000
J/O	Palo Verde – Rudd	500 kV		2700	2700
J/O	Jojoba – Kyrene	500 kV		2000	3000

SOUTHERN NAVAJO TRANSMISSION LINES

J/O	Navajo – Westwing	500 kV	40%	1137	1530
J/O	Navajo – Moenkopi	500 kV	70%	1880	2538
J/O	Moenkopi – Yavapai	500 kV	29%	1524	2057
J/O	Yavapai – Westwing	500 kV	43%	1219	1645

SOUTHWEST OF FOUR CORNERS TRANSMISSION LINES

APS	Four Corners – Moenkopi	500 kV	24%	1810	2520
APS	Four Corners – Cholla 1&2	345 kV	25%	1260	1500

ARIZONA EHV TRANSMISSION LINES

	Browning – Kyrene	500 kV		2000	2000
APS	Cholla – Pinnacle Peak 1&2	345 kV		1000	1310
APS	Cholla – Saguaro	500 kV	35%	1026	1539
	Coronado – Cholla	500 kV		2000	2000
	Coronado – Silver King	500 kV		2000	2000
	Greenlee - Vail	345 kV	28%	1500	1857
	Hassayampa – Jojoba	500 kV		2000	2560
	Saguaro – Tortolita 1&2	500 kV		1262	1514
	Silver King – Browning	500 kV		2000	2000
	Springerville – Coronado	345 kV		1264	1517
	Springerville – Greenlee	345 kV	38%	1247	1690
	Springerville – Vail	345 kV	49%	1115	1439
	Vail – South	345 kV		1548	1858

NEW MEXICO EHV TRANSMISSION LINES

	Hidalgo – Luna	345 kV		1200	1600
	Four Corners – San Juan	345 kV		2000	2000
	Four Corners – Shiprock	345 kV		2008	2209
	Four Corners – West Mesa	345 kV	34%	1760	2000
	McKinley – Springerville 1&2	345 kV		1548	1857
	San Juan – McKinley 1&2	345 kV	30%	1300	1700
	San Juan – B-A	345 kV	34%	1760	2000
	San Juan – OJO	345 kV		1200	1200
	San Juan - Shiprock	345 kV		1800	1800
	Springerville – Luna	345 kV	26%	1100	1484
	Four Corners - Pillar	230 kV		800	1000

Appendix B
Minimum Arizona, Southern Nevada, and
Southern California Bus Voltage Limits

Minimum Arizona, Southern Nevada and Southern California Bus Voltage Limits			
Bus	Pre-Outage Min. Volt (p.u.)	Post-Disturbance Min. Volt (p.u.)	
Adelanto 500kV	Flag if < 1.025	0.95	
Devers 500kV	Flag if < 0.987	0.945	
Valley 500kV	Flag if < 0.987	0.945	
SCE 500kV	Flag if < 0.9975	0.966	<i>[Doesn't allow 5% drop]</i>
Sylmar 230kV	Flag if < 0.99	0.95	
DWP	1.00	0.95	
Mead 230kV	0.95	0.95	<i>[Doesn't allow 5% drop]</i>
NPCO 230kV	0.985	0.90	
SDG&E	0.95	0.90	
SCE 230kV	Flag if < 0.95	0.90	
Devers 230kV	Flag if < 0.95	0.90	
Mirage 230kV	0.90	0.90	<i>[Doesn't allow 5% drop]</i>
Westwing 230kV	Flag if < 1.03	0.95	
Blythe 161kV	Flag if < 0.95	0.91	
MWD	Flag if < 0.9875	0.95	
Arizona 230 kV	1.00	0.95	

Appendix C
WECC Post-transient/Transient Stability
Voltage and Transient Frequency Criteria

WECC Transient Stability and Post-Transient Voltage Criteria				
Performance Level	Disturbance	Transient Voltage Dip Criteria	Minimum Transient Frequency	Post Transient Voltage Deviation
B	Generator One Circuit One Transformer PDCI	Max V Dip – 25% Max Duration of V Dip Exceeding 20% - 20 cycles Not to exceed 30% at non-load busses.	59.6 Hz for 6 cycles or more at a load bus.	Not to exceed 5% at any bus. *
C	Two Generators Two Circuits IPP DC	Max V Dip – 30% at any buss. Max Duration of V Dip Exceeding 20% - 40 cycles at load busses.	59.0 Hz for 6 cycles or more at a load bus.	Not to exceed 10% at any bus.

CONDITION 8

The new transmission line shall interconnect with the existing 345kV and/ or 500kV transmission lines at either or both the Red Mesa or Moenkopi substations. If Segment 2 has not been completed, energized, and capable of operating at its rated capacity, then the new transmission line shall interconnect with the existing 345kV and/ or 500kV transmission lines at both the Red Mesa and Moenkopi substations.

RESPONSE

Final design work for this project has not been completed and construction has not commenced. Based on the results of the interconnection studies and the final design for the Project, a decision will be made regarding the interconnection with existing transmission lines at either or both the Red Mesa or Moenkopi substations. The Applicant will comply with the stipulations of Condition 8.